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**ENVIRONMENTAL EVALUATION
INLAND WETLANDS**

**PROPOSED WHITE OAK FARM
LEBANON ROAD (ROUTE 16)
COLCHESTER, CONNECTICUT**

Prepared by:

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INTRODUCTION

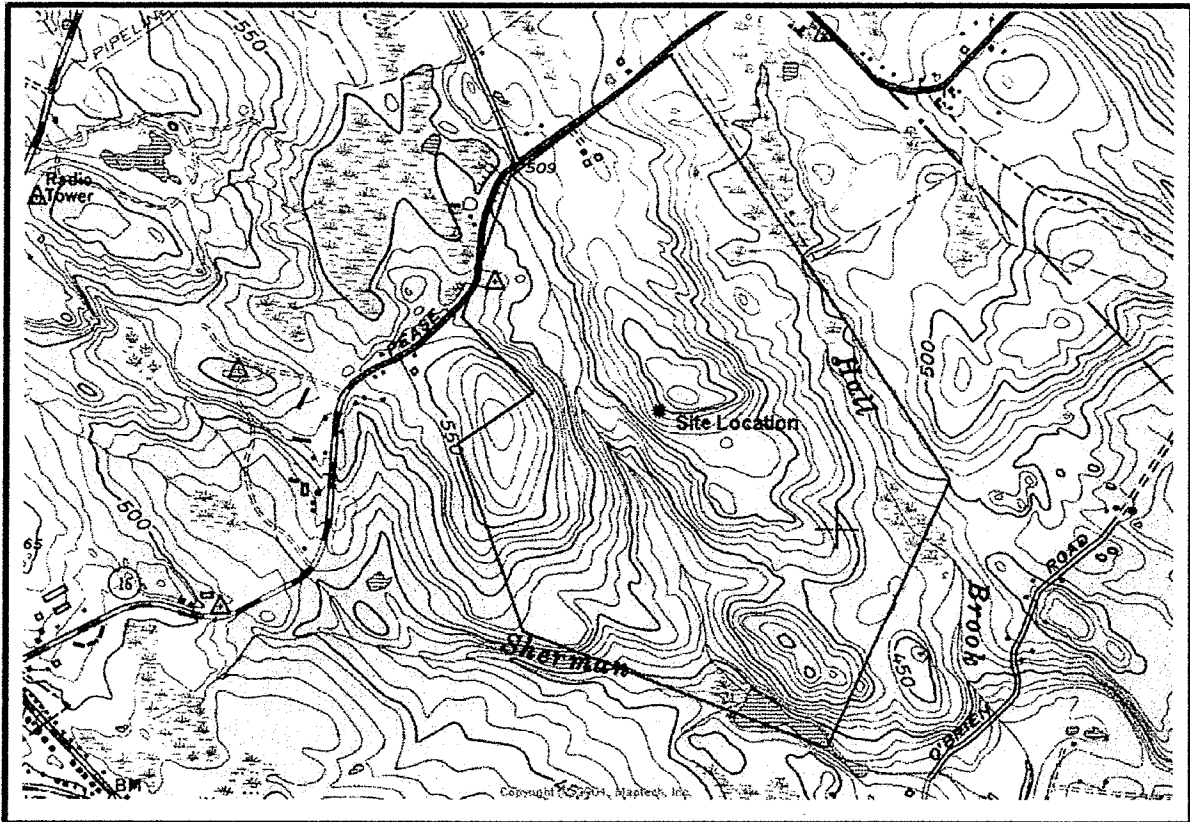
The following report presents an assessment the natural resource values of wetlands and watercourses and an evaluation the potential impacts upon those resources that may result from the residential development of a 450 ± acre property to be known as White Oak Farm in Colchester, Connecticut. The applicant is proposing to construct 141 single family homes on the property. The property lies to the south of Lebanon Road (Route 16).

Field investigations of the property were conducted during July, August, September, and December of 2004. During inspections wetland habitats on the property were thoroughly examined and data gathered. The inventory of wildlife included species directly observed, species detected by call or song, and evidence of wildlife use such as nests, tree cavities, burrows, tracks, scat, or skeletal remains. Site plan maps, an aerial photograph and the United States Geological Survey topographical map (Colchester Quadrangle) were consulted. Wetland evaluations contained in this report were performed utilizing criteria proposed by the Highway Methodology, US Army Corps of Engineers and the criteria presented in DEP Bulletin Number 9.

EXISTING CONDITIONS

Topography

The property is irregular with respect to topography. There are two large, drumlin-like upland knolls on the property with stream valleys between them. The highest elevations of 570 feet NGVD and 590 feet NGVD occur on top of knolls at the center of the property and at the west central section of the property, respectively. Another high spot is an upland knoll located at the southern end of the parcel. The low points of the property occur at the southern end of the site where Hall Brook and an unnamed brook exit the site. Both of these watercourses flow in a general southeasterly direction.



Excerpt from USGS Topographical Map Depicting the Property

Upland Habitats

The portion of the property that is proposed for development consists of the upland habitats occupied by the knolls. The uplands contain old field habitat and second growth woodlands. Mixed hardwoods cover most of the woodlands with oak-hickory forests occupying the higher knolls and sugar maple dominating lower slope woodlands. Tree species within the upland habitats include sugar maple, red oak, black oak, white oak, ironwood, red maple, black cherry, white ash, flowering dogwood, American elm and tulip poplar. Upland shrub species include huckleberry, low bush blueberry, maple-leaved Viburnum, Japanese barberry, and gray dogwood. In the fields, dominant species include goldenrods, asters and various grasses. Woody species are beginning to colonize, and include red cedar, multiflora rose and autumn olive.

Wetland Habitats

Many discrete wetlands occur on the property and these will be numbered for clarity and descriptive purposes. The numbering system used is arbitrary, loosely following the topographic and vegetative characteristics of the different wetlands; it should not be considered as a ranking of the wetlands. On the western half of the property, an unnamed stream flows from Pease Road (Route 16) onto the property. It traverses the entire length of the parcel flowing from the northwest toward the southeast. *Wetland 1* includes the associated forested wetlands that form a corridor throughout most of the length of the stream. Toward the southern end of the property, there is a large marsh, identified as *Wetland 2* that formed from the damming of the stream by beavers. Wetlands 1 and 2 form an exceptionally diverse wetland system that is high in wetland functions and values.

Along the *Wetland 1* stream corridor, dominant trees include sugar maple, red oak, red maple, and yellow birch. Witch hazel is a common understory tree. Shrubs and vines include highbush blueberry, spicebush, poison ivy, Virginia creeper, and sweet pepperbush. A lush growth of herbaceous species is present and is characterized by fern glades that include cinnamon fern, interrupted fern, New York fern, lady fern, marginal woodfern, and crested fern. Skunk cabbage, Jack-in-the-pulpit, false nettle, and several species of clubmoss are also prominent. (Please see Appendix for comprehensive species list).

As stated, *Wetland 2*, the large beaver impoundment marsh, is highly diverse. There are a few scattered trees, alder and red maple, as well as scattered clumps of sweet pepperbush and buttonbush. However, herbaceous species comprise most of the wetland, which is fully saturated throughout the year. Other than two small patches dominated by common reed (*Phragmites australis*), there is no one dominant species. Arrow-leaved tearthumb, climbing hemp, pickerel weed, water willow, woolgrass, marsh St. Johnswort, jewelweed, common cattail, three-way sedge, royal fern, bugleweed, swamp milkweed, and a number of sedges are some of the plants found growing within this marsh.

Wetland 3 is also located along the western side of the property and encompasses a wetland that originates in the southwest corner of the property and trends in a southeasterly direction. It eventually flows into the beaver impoundment. It is an

extremely rocky drainageway characterized by pools of standing water. Several vernal pools have been identified within this wetland area. The wetland is forested and dominated by red maple. Other tree species found within Wetland 3 include black birch, American beech, red oak, ash and tulip poplar. Highbush blueberry is one of the dominant shrubs. Sweet pepperbush, spicebush, and swamp azalea are also common. Observable herbaceous species included tree clubmoss, shining clubmoss, ground cedar, partridgeberry, Christmas fern, crested woodfern, and cinnamon fern.

The other primary wetland systems on the property occur along the property's eastern side. These wetlands encompass a portion of a large pond surrounded by a marsh/wet meadow fringe, a beaver impoundment that is a deep, robust emergent marsh, and corridor wetlands associated with the intermittent streams that flow into the pond.

Wetland 4, the most easterly of the property wetlands, is situated in the northeast corner of the parcel. It is a wet meadow that is reverting to a scrub shrub wetland and only a small portion of this wetland is situated on the subject parcel. Fox grape and blackberry are dominant woody species. Northern arrowwood, multiflora rose, and willows are also common. Some of the common herbaceous species include Joe Pye weed, jewelweed, grass-leaved goldenrod, rice cut grass, arrow-leaved tearthumb, purple-leaved willow-herb, New York ironweed, and sensitive fern.

Approximately 300 feet to the west of the wet meadow/scrub-shrub wetland, there is a corridor wetland, identified as *Wetland 5*, which is characterized by small areas of wet meadow, scrub-shrub patches, and forested wetlands. This wetland trends toward the southeast and eventually heads off the property to enter the large pond at a point also off the property. The wet meadow portions of this wetland contain a species mix similar to that of the corner wetland. Additionally, sweet flag, cattail, blue vervain, tussock sedge, manna grass, marsh fern, and blue flag iris are present. Trees and shrubs within the scrub-shrub portions of the wetland include crabapple, red maple, speckled alder, willows, multiflora rose, silky dogwood, northern arrowwood, grape, highbush blueberry, poison ivy, and Virginia creeper. The forested portions of the wetland are different in character as well as in some of the species present. The tree canopy is dominated by red maple. Other tree species include yellow birch, red oak, ash, shagbark hickory, and sugar maple. There are also some scattered red cedars, which indicate that the area was likely

more open in the not too distant past. Dominant shrubs include spice bush and Japanese barberry; northern arrowwood, silky dogwood, Morrow's honeysuckle and winterberry are also found. Vines include oriental bittersweet, poison ivy, and Virginia creeper. Shade tolerant species including cinnamon fern and skunk cabbage dominate the forest floor. Also noted were marsh blue violet, halberd-leaved tearthumb, mad dog skullcap, Jack-in-the-pulpit, clearweed, tall meadow rue, and several species of sedges.

Wetland 6 includes the wet meadow wetlands that are found along the northwestern shoreline of the pond and to the east of the southern shoreline. These wetlands are dominated by herbaceous species including Joe Pye weed, wrinkled goldenrod, tall goldenrod, arrow-leaved tearthumb, woolgrass, sensitive fern, reed canary grass, groundnut, soft rush, path rush, and several species of grasses and sedges. Along the edges of the pond, woody species, particularly buttonbush and alder are found. Cattail, false nettle, jewelweed, sedges, and reed canary grass are common. *Wetland 7* includes the pond itself, which is an open water wetland. In addition to the above-mentioned species growing at the pond margins, pickerel weed, burreed, and fragrant water lily were observed growing within the pond. A number of ducks were seen as well as great blue heron and great egret. Many swallows were also noted hawking over the pond.

Wetland 8 encompasses a beaver pond on the east side of the property. It is similar in species composition to the western beaver pond with respect to species composition. A few grey birch trees are present as well as a number of dead snags, indicating that this area was once a forested wetland. Other species noted within the wetland include false nettle, common cattail, woolgrass, blue vervain, arrowhead, meadowsweet, steplebush, beak rush, spike-rush, goldenrods and sedges.

Wetland 8A lies to the south of Wetland 8 and is separated from it by the remains of a stone dam. It is quite different from Wetland 8 in that it is mostly forested. The wooded wetlands are associated with Hall Brook. Yellow birch is a dominant tree species with red maple and white ash as sub-dominants. Also present are black birch and ironwood. Highbush blueberry is common within the shrub layer as are sweet pepperbush and swamp azalea. Cinnamon fern is the commonest groundcover. Also present are Christmas fern, lady fern, and tree clubmoss.

Wetland 8B is a finger wetland that drains toward the southeast into Wetland 8A. It is a forested wetland dominated by yellow birch and red maple. Black gum and white oak are also present. The shrub and vine layers contain winterberry, spicebush, poison ivy, and Virginia creeper. Shade tolerant species including skunk cabbage, New York fern, hay-scented fern, spinulose woodfern, and goldthread comprise the herbaceous stratum.

Wetland 9 is a long narrow wetland adjacent to an intermittent watercourse that drains into Wetland 8. The wetland drains toward the southeast and at its midpoint branches so that two northerly lobes collect into one drainageway. All portions of Wetland 9 are forested. Red maple and yellow birch are dominant, with black birch a secondary component of the canopy. Spicebush and Japanese barberry are prevalent in the shrub layer. False nettle is a common herbaceous species. Other herbs found within Wetland 9 include New York fern, sensitive fern, Christmas fern, toothed wood-fern, cinnamon fern, interrupted fern, Jack-in-the-pulpit, and wood reed grass.

There are a number of small, isolated wetlands on the property as well. One of these is *Wetland 10*. This wetland occurs within the east-central portion of the property and flows off site at the southern boundary. It is a narrow wetland, approximately 50 feet in width and 700 feet in length. Red maple is the dominant tree species and shagbark hickory is also present. Spicebush and Japanese barberry comprise the shrub layer. Ferns dominate the herbaceous stratum and species include New York fern, hay-scented fern, and Christmas fern. Other species noted are fowl manna grass, blue violet, and Jack-in-the-pulpit.

Wetland 11 is also Vernal Pool 11 and is located approximately 400 feet to the southwest of Wetland 10. It is an isolated, forested wetland with a diverse mix of hardwoods comprising the canopy. Red maple and yellow birch dominate; however, white oak, mockernut and shagbark hickory, black gum, and ironwood are present. Sweet pepperbush, highbush blueberry, common greenbriar, Virginia creeper, and dewberry are present as shrubs and vines. Herbaceous species include royal fern, cinnamon fern, Canada mayflower, tree clubmoss, and interrupted fern.

Wetland 12 is at the north-central portion of the property and is located approximately 250 feet to the west of the barn. It is a wet meadow wetland that is

reverting to shrub cover. Multiflora rose, Morrow's honeysuckle, grape and poison ivy grow rampantly at the edges of this wetland. The dominant herbaceous species include fragrant flat-top goldenrod and fox sedge. Horse nettle, sensitive fern, false nettle, milkweed, tall goldenrod, bulrush, milkweed, and purple-leaved willow-herb are all common species within this isolated wetland.

Wetland 13 is a wet meadow wetland that occupies the large open field adjacent to Route 16 and west of the existing access drive. Dominant species within the wet meadow include wrinkled goldenrod, fragrant flat-top goldenrod, sensitive fern, reed canary grass, and bulrush. There is a diverse mix of herbaceous species throughout the wetland including Joe Pye weed, fox sedge, mountain mint, bugleweed, purple-leaved willow-herb, swamp milkweed, blue flag iris, switchgrass, big bluestem, bugleweed, and curled dock. A few woody species are beginning to colonize including speckled alder, winterberry, multiflora rose, poison ivy, and Virginia creeper. Although isolated, neither Wetland 12 nor Wetland 13 functions as vernal pool habitat.

Within the property wetlands, thirteen vernal pools have been identified by R. Richard Snarski who performed the vernal pool inventory between April and May of 2004. Most of the pools contained spotted salamander and wood frog egg masses. Marbled salamander larvae were observed in only two of the pools. A moderately high concentration of pools and egg masses occur within wetlands 2 and 3 within the southwestern quadrant of the property. The pools are situated in areas of proposed open space and relatively large buffers will surround the pools post-development.

WETLAND FUNCTIONS AND VALUES

The Highway Methodology uses a descriptive approach and identifies thirteen potential wetland functions and values that may or may not be present within the wetland being studied. Wetland functions are intrinsic properties of a wetland ecosystem and wetland values are benefits derived from one or more wetland functions and the physical characteristics associated with the wetland. The functions and values are listed below:

GROUNDWATER RECHARGE/DISCHARGE

This function considers the potential for a wetland to serve as a groundwater recharge and/or discharge area. It refers to the fundamental interaction between wetlands and aquifers, regardless of the size or importance of either.

The wetlands on the site are primarily ground water discharge wetlands in that they are underlain by mineral soils that have a water table close to the surface. Wetlands that may also serve as ground water recharge wetlands include wetlands 1, 2, 8, and 8A which are associated with watercourses. These wetlands may help to maintain base flow in the streams during low water periods.

- FLOODFLOW ALTERATION

This function considers the effectiveness of the wetland in reducing flood damage by water retention for prolonged periods following precipitation events and the gradual release of floodwaters. It adds to the stability of the wetland ecological system or its buffering characteristics and provides social or economic value relative to erosion and/or floodprone areas.

Wetlands 2, 8, and 8A have the potential to be highly efficient with regard to floodwater storage. The smaller, isolated wetlands and the narrow drainageway wetlands (such as wetland 3) are likely to be less effective in terms of floodwater storage; however, all of the site's wetlands perform this function to some degree.

- FISH AND SHELLFISH HABITAT

This function considers the effectiveness of seasonal or permanent watercourses associated with the wetland in question for fish and shellfish habitat.

Hall Brook (included with Wetland 8A) is a perennial watercourse and appears to have suitable habitat for fish and shellfish. Additionally, the pond (Wetland 7) provides habitat for freshwater fish such as bass and perch.

- **SEDIMENT/TOXICANT RETENTION**

This function reduces or prevents degradation of water quality. It relates to the effectiveness of the wetland as a trap for sediments, toxicants, or pathogens in runoff water from surrounding uplands, or upstream eroding wetland areas.

- **NUTRIENT REMOVAL/RETENTION/TRANSFORMATION**

This function considers the effectiveness of the wetland as a trap for nutrients in runoff water from surrounding uplands or contiguous wetlands, and the ability of the wetland to process these nutrients into other forms or trophic levels. One aspect of this function is to prevent ill effects of nutrients entering aquifers or surface waters such as ponds, lakes, streams, rivers or estuaries. The larger wetland systems on the site, Wetlands 1, 2, 3, 5, 6, 8, 8A, 8B, and 9 are all capable of nutrient removal and this is an important function of the wetlands. The deep marshes, Wetlands 2 and 8, are the most effective due to the dense growth of emergent vegetation and the water depth associated with these wetlands.

- **PRODUCTION EXPORT**

This function evaluates the effectiveness of the wetland to produce food or usable products for man or other living organisms.

All of the wetlands contain vegetation that supplies food for different wildlife species. Many of the berry-bearing shrubs such as winterberry, spicebush, and highbush blueberry are important species for wildlife. Birds and small mammals use the seeds, buds, and flowers of red maple for food and the bark and twigs provide browse for deer. Yellow birch is also used by many wildlife species. In short, production export is an important function of the wetlands of this site.

- SEDIMENT/Shoreline Stabilization

This function considers the effectiveness of a wetland to stabilize streambanks and shorelines against erosion.

The wetlands that are associated with Hall Brook and the westerly watercourse function to stabilize the streambanks and guard against erosion. The streamside vegetation helps to anchor the soil and prevent washouts from occurring.

- Wildlife Habitat

This function considers the effectiveness of the wetland to provide habitat for various types and populations of animals typically associated with wetlands and the wetland edge. Both resident and /or migrating species are considered.

As has been indicated, the wetlands on site are diverse habitats that form important corridors for wildlife species. Additionally, within these wetlands, thirteen areas have been identified that function as vernal pools. Spotted salamanders and wood frogs dominate the vernal pools, although marbled salamanders have also been observed. Because of the large expansive wetlands, the habitat is likely to support a wide variety of wildlife species, both wetland-dependent and non wetland-dependent. Deer trails appear throughout the property. Woodcock and many other bird species were observed during the field investigations. Beaver have also been present and otter may be occasional visitors. The pond and marshes are suited for wading birds such as the great blue heron and little green heron. Ducks and geese will also be attracted to the pond.

- Recreation (Consumptive and Non-Consumptive)

This value considers the suitability of the wetland and associated watercourses to provide recreational opportunities such as hiking, canoeing, boating, fishing, hunting and other active or passive recreational activities. Consumptive opportunities consume or diminish the plants, animals, or other resources that are intrinsic to the wetland. Non-consumptive opportunities do not consume or diminish these resources of the wetland.

The wetlands are best suited for passive recreational pursuits such as nature study and bird watching. However, the pond may lend itself to more active forms of recreation such as canoeing and fishing. The property has been used for hunting in the past, but once developed, this form of recreation will no longer occur.

- EDUCATIONAL SCIENTIFIC VALUE

This value considers the suitability of the wetland as a site for an “outdoor classroom” or as a location for scientific study or research.

There are many areas that could be utilized for wetland research or as an outdoor classroom for the study of different wetland cover types. An ongoing study of the vernal pools is another possibility. The fact that there are few invasive species present on the site indicates that the wetlands are relatively pristine habitats. Vegetation studies of the marshes or forested wetlands could be undertaken by students from area schools.

- UNIQUENESS/HERITAGE

This value considers the effectiveness of the wetland or its associated waterbodies to provide certain special values. These may include archaeological sites, critical habitat for endangered species, its overall health and appearance, its role in the ecological system of the area, its relative importance as a typical wetland class for this geographic location. These functions are clearly valuable wetland attributes relative to aspects of public health, recreation, and habitat diversity.

During the course of the field studies of the property, no endangered, threatened, or special concern species were observed. However, there is good habitat for the box turtle, a species of special concern. The DEP Natural Diversity Data Base has been asked to review its files regarding the possible presence of listed species occurring at the site. According to the DEP, there are no known extant populations of Federal or State Endangered, Threatened or Special Concern Species known to occur at this property. Nonetheless, these wetlands may be considered unique in the sense that they are large, diverse systems in good overall ecological condition.

- VISUAL QUALITY/AESTHETICS

This value considers the visual and aesthetic quality or usefulness of the wetland.

The aesthetic values of wetlands are difficult to determine and are frequently subjective. However, it is likely that most reviewers would find that the marshes, watercourses, and the adjacent forested wetlands are aesthetic features of the property. The pond offers scenic vistas and, in general, the wetlands provide diversity to the landscape.

- ENDANGERED SPECIES HABITAT

This value considers the suitability of the wetland to support threatened or endangered species.

As indicated, the presence of endangered, threatened or special concern species has not been documented at this site by either the Natural Diversity Data Base of the Connecticut Department of Environmental Protection or by the extensive field investigations conducted at the site.

DEP BULLETIN # 9

The wetlands were also evaluated utilizing the criteria established in Bulletin # 9 entitled *Method for the Evaluation of Inland Wetlands in Connecticut*, a publication of the Connecticut Department of Environmental Protection (DEP). This publication, which assigns numerical values to wetlands, was not intended for use in the evaluation of individual wetlands, but rather for analysis of all wetlands within a large watershed system. Nonetheless, the criteria are useful in providing additional information regarding wetland values. For this report, no numerical ratings are provided, and best professional judgment was utilized in determining functional values. Furthermore, the wetlands were considered as a single system and evaluated as a whole, rather than as 13 individual wetland systems. Table 2 provides an overview of the evaluation criteria. (See Table 2 on Page 13).

Table 2: Wetlands Assessment Summary

Function	Wetland
Ecological Integrity	High
Wildlife Habitat	High
Finfish Habitat	
<i>Streams/Rivers</i>	Good to Excellent
<i>Ponds/Lakes</i>	Good to Excellent
Educational Potential	High-Moderate
Visual/Aesthetic Quality	High
Water-based Recreation	Moderate
Flood Control	High
Groundwater Use Potential	N/A
Nutrient Retention/Sediment Trapping	
<i>Opportunity</i>	Low
<i>Efficiency</i>	High
Shoreline Anchoring & Dissipation of Erosion Forces	Moderate-High
Noteworthiness	High-Moderate

Note: Table derived from CT DEP Bulletin No. 9. Best professional judgment utilized in the assessment of wetlands.

Ecological Integrity

This evaluates the overall health and function of the wetland ecosystem and assesses the degree to which the wetlands and the adjacent areas have been disturbed by human activity (agricultural, residential development, filling, draining, crossings by roads or trails, etc.). In general, the greater the degree of ecological integrity, the more valuable the wetland will be for a variety of functions (e.g. educational potential, habitat). The lands adjacent to some of the wetlands on site have been somewhat disturbed by various past activities, particularly agricultural; however, the wetlands themselves are largely undisturbed and few invasive species are present. For these reasons, the wetlands are rated *High* for ecological integrity.

Wildlife Habitat

This assesses the degree to which wetlands provide habitat for a variety of animal species including wetland-dependent species. Marshes, swamps, and bogs contain diverse plant communities, which are adapted to high groundwater conditions. Wetland vegetation provides food, cover, and breeding sites for mammals, birds, reptiles, amphibians, and invertebrates. Some wetlands provide corridors that are important for the movement of wildlife. The wetlands are rated *High* for wildlife habitat based upon the variety of plant community types present and field observations.

Finfish Habitat

Wetlands are frequently associated with watercourses and/or open bodies of water. Brooks, streams, rivers, ponds, and lakes all provide finfish cover, feeding, and spawning areas. This function is divided into two groups: streams/rivers and ponds/lakes. The first group considers criteria such as stream channel type, stream gradient, water quality, available shade cover, and land uses within the watershed above the wetland. Considerations for ponds/lakes include total area of the waterbody, depth, water quality, and the presence of aquatic vegetation. Hall Brook appears to have the requisite characteristics for fisheries habitat and the pond is likely to contain freshwater fish such as bass and perch. Therefore, finfish habitat is rated as *Good to Excellent*.

Educational Potential

Field trips are an important part of environmental education, and wetlands provide ideal outdoor classrooms for the teaching of a number of ecological principles. This section assesses the suitability of a wetland for such use and considers factors such as proximity to schools, safe parking and ease of access, ecological integrity, and the diversity of the plant community. The wetlands are rated *High-Moderate* for education potential. The wetlands are proposed as open space and thus will be accessible to school groups. There is good potential for nature and biological study of these wetlands.

Visual/Aesthetic Quality

Wetlands are often areas of scenic beauty. This functional value considers the viewing locations of the wetland, the dominant wetland type, presence of open water, noise levels, and dominant surrounding land uses. Noise levels and odors in the immediate vicinity of the wetland are also considered. All of these factors determine the aesthetic quality of a given wetland. The wetlands are rated *High* for aesthetic values. The wetlands are highly diverse with different cover types present. They are well-removed from noise and odors and there are good vantage points for viewing.

Water-based Recreation

Wetlands associated with a perennial stream, lake, or pond may provide recreational opportunities such as canoeing, fishing, boating, hunting, and wildlife observation. Bulletin No. 9 considers factors that determine the suitability of the resource for these activities. This function is only evaluated if a perennial watercourse, lake, or pond is present within the wetland. There is good potential at the pond for non-motorized boating. Access for fishing is another possibility; therefore, the wetlands are rated *Moderate* for this function.

Flood Control

Among the most important functions of wetlands is the ability to store storm water and thereby reduce the potential for downstream flooding. Several criteria are considered in evaluating wetlands for this function. These include: size of the wetland, size of the watershed above the wetland; and size of the watershed above the damage area. (A damage area is defined as the nearest structure downstream of the wetland,

which may be damaged during storm events). As previously indicated, flood control is an important function of these wetlands, thus they are rated *High* for flood control.

Groundwater Use Potential

Sources of potable water are extremely important throughout the state. Wetlands are linked with groundwater systems, and in some wetlands, surface water percolates down to the underlying groundwater. Most wetlands are groundwater discharge areas in which groundwater at or near the surface is released into the wetland. In evaluating this function, consideration is given to surface and groundwater quality, the presence of downstream public water supply wells, and the potential of the wetland to yield large quantities of water.

Nutrient Retention/Sediment Trapping

Excess sediments and nutrients can impair natural aquatic ecosystems. Many wetlands serve as effective sediment traps and remove suspended particles from surface water flowing through them. Criteria that determine a wetlands pollution filtration capacity include topography (i.e. slope), potential sources of sediments in the watershed above the wetland, size of the wetland in relation to its watershed, effective flood storage capability of the wetland, and dominant land use.

This function is divided into two parts: opportunity and efficiency. The former considers the degree to which existing conditions allow a wetland to perform the function and the second part considers the physical characteristics that would enable a wetland to efficiently trap or remove pollutants. As already indicated, the wetlands perform an important role in filtering sediments and trapping nutrients due to their physical structure and dense vegetation. The wetlands have therefore been rated *High* for this function.

Shoreline Anchoring & Dissipation of Erosive Forces

Shoreline anchoring is an important function of wetlands. Wetlands frequently serve as a natural buffer between watercourses and uplands, particularly in areas prone to wave action or bank scouring due to rapid flows. The buffering reduces shoreline erosion and potential sediment deposition within the watercourse. Criteria considered in evaluating this function include wetland morphology and, vegetation density within the wetland, and the width of the wetland bordering a watercourse. These wetlands perform

this function and serve as a buffer between the watercourses and the adjacent uplands. They are rated *Moderate-High* for this function.

Noteworthiness

Noteworthiness refers to special features of a given wetland that gives it a high value regardless of any other attributes. Such features might be that the wetland contains critical habitat for a state or federal threatened and/or endangered species, an important historical or archaeological site, or is a known study site for scientific research.

The Natural Diversity Data Base of the Connecticut Department of Environmental Protection has stated that there are no known species that are rare, threatened, or of special concern occurring at the site. The wetlands are rated *High-Moderate* for Noteworthiness.

PROPOSED DEVELOPMENT AND POTENTIAL WETLAND IMPACTS

The proposed project entails the development of 141 housing units and associated driveways and access roadways. All of the structures associated with the development will be constructed on the upland portions of the site. Direct activities within wetland habitats include the following:

1. Wetland filling for road crossing, station 3+00 Sherman's Brook Road.
Area to be filled = 2,670 s.f.
2. Wetland filling for stonewall relocation along Lebanon Avenue, wall to be moved 2' away from road into wetland for 146 foot length to allow for the sidewalk to be constructed between the wall and the edge of Lebanon Avenue. Area to be filled = 300 s.f.
3. Wetland filling for 8' extension to 3 existing culverts under Lebanon Avenue to allow for sidewalk construction. Area to be filled = 240 s.f.

With regard to the first direct activity, in order to provide access to proposed dwelling units on the western side of the property, a crossing of wetlands is necessary. The proposed crossing location coincides with an existing crossing of a woods road and is at the narrow point of a finger of Wetland 1. The crossing will entail the removal of some sapling trees; however, flow will be maintained and no alteration of wetland function is anticipated to occur as a result of this activity.

The Town of Colchester has requested the construction of a sidewalk along Lebanon Avenue. Such construction is not feasible without the minor filling of wetlands. As these wetlands are close to the road and therefore somewhat disturbed already, the loss of approximately 540 square feet of wetlands will not diminish the overall functional quality of the wetlands on site. The sidewalk construction is therefore considered to be a minor activity that will have minimal negative consequences upon wetland habitats.

Other regulated activities proposed for the site include:

1. Excavation of wetlands for fire water storage,
2. Re-grading within the regulated review area for lot development,
3. The Lebanon Avenue sidewalk construction within the regulated review area,
4. Construction of a Drainage Basin in open field, and
5. The discharge of stormwater.

The total area of regulated activities for sidewalk, road and drainage improvements amounts to 147,421 s.f. or 3.38 acres and the total area of regulated activities for lot development amounts to 14, 335 s.f. or 0.32 acres. This is an extremely small proportion of the total site, which encompasses 450 ± acres.

The project design includes 12 pipes that have grit and oil separators, which outlet to rip raps pads without any level spreaders or infiltration basins. Of these twelve, one is 37' from the wetlands, 5 are from 50 to 100' from the wetlands, 1 is 128' from wetlands, and 5 are greater than 300' from wetlands. There are no direct discharges to wetlands and the rip rap pads and overland flow will help to renovate stormwater before it reaches the wetlands proper. All of the other outlets have either level spreaders and oil grit separators, or discharge to a retention basin with a leaky berm designed to hold water for several days. Therefore, there is unlikely to be any contamination of wetland habitats resulting from the discharge of stormwater from the site.

Prior to construction, erosion control measures will be installed. It is strongly recommended that wood chip berms be utilized for erosion control in areas where the slopes are steep and/or the regrading is in close proximity to the regulated areas. Wood chip berms do an excellent job in trapping sediments and the chances of failure are greatly reduced when wood chip berms are utilized in lieu of silt fencing or hay bales.

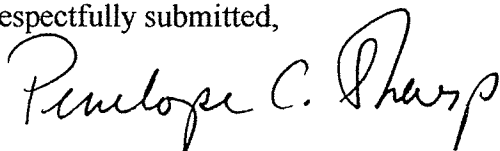
The latter are frequently installed incorrectly or not maintained, often resulting in the transport of sediments into wetlands. In areas where wood chip berms are not utilized and either silt fencing or hay bales are utilized, these devices should be inspected frequently and replaced as needed.

The development will be phased in order that the entire site will not be exposed at one point in time. The roadways and utility lines will be installed during the first several phases. Temporary sediment basins will be constructed and stockpile areas are depicted on the Sedimentation & Erosion Control Plan maps. The stockpile areas will be surrounded on the downslope sides with sediment control devices. It is also recommended that these areas be netted or otherwise protected from windborne erosion.

CONCLUSION

The project proposal entails the development of 141 single family housing units, access driveways and roadways. The site contains $100.6 \pm$ acres of wetlands of which only 0.07 acres will be directly disturbed by the proposed development. Approximately 255.0 acres or 59.5 percent of the site, well over half of it, will remain as permanent open space. Of this acreage, 157.5 acres are uplands that are included within the open space. The wetlands are, for the most part, diverse and highly functional habitats that show little sign of disturbance. They provide many important wetland functions and excellent habitat opportunities for area wildlife species. A number of vernal pools are included within the wetland habitats. Great care has been exercised in the design of the development to avoid wetland impacts. This has been accomplished and impacts to both wetlands and the regulated upland review areas have been kept to a minimum. The project design protects the critical natural resources of this site and provides significant open space corridors for the future. The proposal offers an excellent blend of development for housing purposes and the protection and preservation of natural resources for future generations.

Respectfully submitted,

A handwritten signature in black ink, reading "Penelope C. Sharp". The signature is written in a cursive, flowing style with a large initial "P".

Penelope C. Sharp

APPENDIX

PLANT SPECIES LIST
for
WETLAND HABITATS
PROPOSED WHITE OAK FARM
COLCHESTER, CONNECTICUT

Scientific Name	Common Name	Abundance	Indicator Status
TREES			
<i>Acer rubrum</i>	Red maple	C	FAC
<i>Acer saccharum</i>	Sugar maple	M	FACU-
<i>Alnus rugosa</i>	Speckled alder	M	FACW+
<i>Betula alleghaniensis</i>	Yellow birch	C	FAC
<i>Betula lenta</i>	Black birch	C	FACU
<i>Betula populifolia</i>	Gray birch	U	FACU
<i>Carpinus caroliniana</i>	Ironwood	M	FAC
<i>Carya ovata</i>	Shagbark hickory	M	FACU-
<i>Cornus florida</i>	Flowering dogwood	P	FACU-
<i>Fagus grandifolia</i>	American beech	M	FACU
<i>Fraxinus americana</i>	White ash	M	FACU
<i>Hamamelis virginiana</i>	Witch hazel	M	FAC-
<i>Juniperus virginiana</i>	Red cedar	U	FACU
<i>Liriodendron tulipifera</i>	Tulip poplar	M	FACU
<i>Nyssa sylvatica</i>	Black gum	M	FAC
<i>Quercus alba</i>	White oak	M	FACU-
<i>Quercus rubra</i>	Red oak	C	FACU
<i>Salix nigra</i>	Black willow	P	FACW+
<i>Salix babylonica</i>	Weeping willow	P	FACW-
<i>Ulmus americana</i>	American elm	M	FACW-
SHRUBS and VINES			
<i>Aronia melanocarpa</i>	Black chokeberry	U	FAC
<i>Berberis thunbergii</i>	Japanese barberry	M	FACU
<i>Celastrus orbiculatus</i>	Oriental bittersweet	U	UPL
<i>Cephalanthus occidentalis</i>	Buttonbush	U	OBL
<i>Clethra alnifolia</i>	Sweet pepperbush	C	FAC+
<i>Cornus amomum</i>	Silky dogwood	C	FACW
<i>Ilex verticillata</i>	Winterberry	U	FACW+
<i>Lonicera morrowii</i>	Morrow's honeysuckle	U	FACU
<i>Lindera benzoin</i>	Spicebush	C	FACW-
<i>Lyonia ligustrina</i>	Maleberry	M	FACW
<i>Parthenocissus quinquefolia</i>	Virginia creeper	M	FACU
<i>Rhododendron viscosum</i>	Swamp azalea	M	OBL
<i>Rosa multiflora</i>	Multiflora rose	U	FACU
<i>Rosa palustris</i>	Swamp rose	M	OBL
<i>Rubus occidentalis</i>	Black raspberry	M	FAC
<i>Rubus sp.</i>	Dewberry	U	---
<i>Salix discolor</i>	Pussy willow	M	FACW
<i>Salix sp.</i>	Willow	U	---
<i>Smilax rotundifolia</i>	Cat briar	M	FAC

<i>Spiraea latifolia</i>	Meadowsweet	M	FAC+
<i>Spiraea tomentosa</i>	Steeplebush	M	FACW
<i>Toxicodendron radicans</i>	Poison ivy	M	FAC
<i>Vaccinium corymbosum</i>	Highbush blueberry	M	FACW-
<i>Viburnum acerifolium</i>	Maple-leaved viburnum	U	UPL
<i>Viburnum recognitum</i>	Northern arrowwood	M	FACW-
<i>Vitis labrusca</i>	Fox grape	M	FACU

HERBACEOUS SPECIES

<i>Acorus calamus</i>	Sweet flag	U	OBL
<i>Agrostis alba</i>	Red top	P	FAC
<i>Apios amerinana</i>	Wild bean	P	FACW
<i>Andropogon gerardii</i>	Big bluestem	P	FAC
<i>Aralia nudicaulis</i>	Wild sarsaparilla	P	FACU
<i>Arisaema triphyllum</i>	Jack-in-the-pulpit	M	FACW-
<i>Asclepias incarnata</i>	Swamp milkweed	P	OBL
<i>Asclepias syriaca</i>	Common milkweed	P	UPL
<i>Aster divaricatus</i>	White wood aster	U	UPL
<i>Athyrium felix-femina</i>	Lady fern	M	FAC
<i>Boehmeria cylindrica</i>	False nettle	U	FACW+
<i>Calamagrostis canadensis</i>	Blue-joint grass	P	FACW+
<i>Cardamine diphylla</i>	Toothwort	U	FACU
<i>Carex bromoides</i>	Sedge	P	FACW
<i>Carex comosa</i>	Sedge	P	OBL
<i>Carex crinita</i>	Sedge	P	OBL
<i>Carex folliculata</i>	Sedge	P	---
<i>Carex intumescens</i>	Sedge	P	FACW+
<i>Carex lupulina</i>	Sedge	P	OBL
<i>Carex lurida</i>	sedge	U	OBL
<i>Carex stricta</i>	Tussock sedge	M	OBL
<i>Carex swanii</i>	Swann's sedge	P	FACU
<i>Carex utricularia</i>	Sedge	P	---
<i>Carex vulpinoidea</i>	Fox sedge	U	OBL
<i>Carex spp.</i>	Sedges	P	---
<i>Chimaphila maculata</i>	Spotted wintergreen	P	NI
<i>Chrysosplenium americanum</i>	Golden saxifrage	P	OBL
<i>Cinna latifolia</i>	Wood reedgrass	U	FACW
<i>Daucus carota</i>	Queen Anne's lace	P	UPL
<i>Dryopteris carthusiana</i>	Wood fern	U	FAC+
<i>Dryopteris intermedia</i>	Evergreen woodfern	P	FACU
<i>Dryopteris marginalis</i>	Marginal woodfern	U	FAC
<i>Dulichium arundinaceum</i>	Three-way sedge	P	OBL
<i>Epilobium coloratum</i>	Purple leaf willow herb	P	OBL
<i>Equisetum arvense</i>	Field horsetail	P	FAC
<i>Eupatorium maculatum</i>	Joe Pye weed	C	FACW
<i>Eupatorium perfoliatum</i>	Boneset	P	FACW+
<i>Euthamia graminifolia</i>	Fragrant flat-top goldenrod	C	FAC
<i>Galium palustre</i>	Marsh bedstraw	P	OBL
<i>Geranium maculatum</i>	Wild geranium	P	FACU
<i>Geum laciniatum</i>	Rough avens	P	FAC+
<i>Glyceria canadensis</i>	Manna grass	U	OBL

<i>Glyceria striata</i>	Fowl manna grass	P	FACW
<i>Impatiens capensis</i>	Jewelweed	M	FACW
<i>Iris versicolor</i>	Slender blue flag	U	OBL
<i>Juncus effusus</i>	Soft rush	U	FACW+
<i>Juncus tenuis</i>	Path rush	P	FAC-
<i>Leersia oryzoides</i>	Rice cut grass	U	OBL
<i>Lycopodium complanatum</i>	Ground cedar	U	FACU-
<i>Lycopodium lucidulum</i>	Shining clubmoss	P	FACW-
<i>Lycopodium obscurum</i>	Tree clubmoss	M	FACU
<i>Lycopus americanus</i>	American bugleweed	P	OBL
<i>Lysimachia terrestris</i>	Swamp candles	P	OBL
<i>Lythrum salicaria</i>	Purple loosestrife	M	FACW+
<i>Maianthemum canadense</i>	Canada mayflower	U	FAC-
<i>Mikania scandens</i>	Climbing hempweed	U	FACW+
<i>Mitchella repens</i>	Partridge berry	P	FACU
<i>Monotropa uniflora</i>	Indian pipe	P	FACU
<i>Myosotis sp.</i>	Forget-me-not	U	---
<i>Nymphaea odorata</i>	Fragrant water-lily	P	OBL
<i>Onoclea sensibilis</i>	Sensitive fern	M	FACW
<i>Osmunda cinnamomea</i>	Cinnamon fern	C	FACW
<i>Osmunda claytoniana</i>	Interrupted fern	P	FACW
<i>Osmunda regalis</i>	Royal fern	U	OBL
<i>Panicum virgatum</i>	Switchgrass	P	FAC
<i>Phalaris arundinacea</i>	Reed canary grass	U	FACW+
<i>Phleum pratense</i>	Timothy grass	P	FACU
<i>Pilea pumila</i>	Clearweed	P	FACW
<i>Podophyllum peltatum</i>	May-apple	P	FACU
<i>Polygonum hydropiperoides</i>	Smartweed	P	OBL
<i>Polygonum arifolium</i>	Halberd leaved tearthumb	U	OBL
<i>Polygonum sagittatum</i>	Arrow-leaved tearthumb	U	OBL
<i>Polystichum acrostichoides</i>	Christmas fern	M	FACU-
<i>Pontederia cordata</i>	Pickernelweed	P	OBL
<i>Prunella vulgaris</i>	Self-heal	P	FACU+
<i>Pycnanthemum tenuifolium</i>	Mountain mint	P	FACW
<i>Rhexia virginica</i>	Meadow beauty	P	OBL
<i>Rumex crispus</i>	Curled dock	P	FACU
<i>Scirpus expansus</i>	Woodland bulrush	P	OBL
<i>Scirpus cyperinus</i>	Woolgrass	M	FACW+
<i>Scirpus hattorianus</i>	Bulrush	C	FACW
<i>Scirpus validus</i>	Soft stem bulrush	P	OBL
<i>Solanum carolinense</i>	Horse nettle	P	UPL
<i>Solidago altissima</i>	Tall goldenrod	C	FACU-
<i>Solidago rugosa</i>	Wrinkled goldenrod	C	FAC
<i>Solidago uliginosa</i>	Bog goldenrod	P	OBL
<i>Sparganium sp</i>	Bur reed	U	OBL
<i>Symphiotrichum pilosus</i>	White heath aster	P	UPL
<i>Symplocarpus foetidus</i>	Skunk cabbage	C	OBL
<i>Thalictrum pubescens</i>	Tall meadow rue	P	FACW
<i>Thelypteris noveboracensis</i>	New York fern	C	FAC
<i>Triadenum virginicum</i>	Marsh St. Johns-wort	P	OBL
<i>Typha latifolia</i>	Common cattail	M	OBL
<i>Uvularia sessilifolia</i>	Bellwort	P	FACU-
<i>Verbena hastata</i>	Blue vervain	U	FACW+
<i>Viola cucullata</i>	Marsh blue violet	P	FACW+

<i>Viola blanda</i>	Sweet white violet	M	FACW
<i>Viola papilionacea</i>	Common blue violet	P	FAC

Abundance Codes: A = abundant (>65%); C = common (40-64%); M = Moderate (20-39%)
U = uncommon (5-19%), P = Present (<5%)

Please Note: Species list comprehensive, but not all-inclusive

Indicator Status Key

OBL	Obligate Wetland:	Occurs with estimated 90% probability in wetlands
FACW	Facultative Wetland:	Estimated 67%-99% probability of occurrence in wetlands
FAC	Facultative:	Equally likely to occur in wetlands and non-wetlands, 34%-66% Probability
UPL	Obligate Upland:	Occurs in non-wetlands > 99% in this region
NI	No Indicator:	Insufficient information available to determine an indicator status

Positive or negative signs indicate a frequency toward higher (+) or lower (-) frequency of occurrence within a category

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